

NOTES ON SOUTHWESTERN MORACEAE

Alan T. Whittemore

US National Arboretum
3501 New York Ave NE
Washington, DC 20002-1958 U.S.A.

ABSTRACT

Specimens forming the basis of reports of *Ficus palmata* (*F. pseudo-carica*) in North America are misidentified and actually belong to *F. carica*, so *F. palmata* must be excluded from the adventive flora of North America. *Morus nigra* is present as a rare waif in California and Nevada. It is best distinguished from other *Morus* species in the area by its deeply cordate leaves and densely pubescent styles 3–5 mm long.

RESUMEN

Los especímenes en que se basan las citas de *Ficus palmata* (*F. pseudo-carica*) en Norte América están mal identificados y pertenecen a *F. carica*, por lo que *F. palmata* debe excluirse de la flora adventicia de Norte América. *Morus nigra* está presente como una planta rara abandonada en California y Nevada. Se diferencia de otras especies de *Morus* en el área por sus hojas profundamente cordadas y estilos densamente pubescentes de 3–5 mm de longitud.

Moraceae are primarily trees and shrubs of tropical and subtropical areas, with few herbaceous species and few taxa found in areas with cooler climates. The family is poorly represented in the flora of the southwestern United States: recent floras list only two native species, *Morus microphylla* Buckl. (which occurs from central Texas west to Arizona and across northern Mexico) and *M. rubra* L. (an eastern species that crosses the Great Plains in Texas), and three introduced species, *M. alba* L., *Ficus carica* L., and *Maclura pomifera* (Raf.) Schneid., from the western half of the country (McClintock 1993; Wunderlin 1997). Two other exotic species not mentioned in these floras, *Ficus palmata* Forrsk. and *Morus nigra* L., have been recorded as escapes in California and Nevada. In the course of revising McClintock's treatment for the second edition of the *Jepson manual of the higher plants of California*, specimens vouchering these reports were examined in order to clarify the status of these species as possible escapes in North America.

California reports of *Ficus palmata*

Ficus palmata is a small tree or shrub native from Iran east to India and Nepal, and south to Ethiopia and Somalia. It is closely related to the commercial fig, *Ficus carica* L., a native of the Near East that is now naturalized at scattered sites across much of the southern United States (Wunderlin 1997), but *F. palmata* differs in having smaller, often unlobed, leaves and smaller fruit (Browicz 1982; Friis 1993; Ghafoor 1985). *Ficus palmata* (= *F. pseudo-carica* Miq.) has been re-

ported from southern California, first by Munz (1974). Munz used the newer synonym *F. pseudo-carica* Miq. and described it as similar to *F. carica*, but with leaves more deeply divided, a description that is at odds with descriptions and keys in recent floras of areas where *F. palmata* is native (Browicz 1982; Friis 1993; Ghafoor 1985). Munz listed the species as "Reported as occasional escape in Santa Barbara region," the phrasing suggesting that Munz picked up his identification from another source. Smith (1976, 1998) mentioned two collections by Henry M. Pollard from "west fork of Cold Springs [sic] Canyon, Montecito." The species was not treated for California in the most recent state flora (McClintock 1993) or the *Flora of North America* (Wunderlin 1997), but it was reported again (this time under the older name *F. palmata*) by Hrusa et al. (2002), who cited a single collection from Santa Barbara County, California, made by Henry Pollard in 1958.

In view of the irregular treatment of this species (reported by several local floras, but not the most recent state and national floras) and the mismatch between the keys and descriptions of *F. palmata* in the North American and Old World literature, it seemed best to examine the specimens that the California reports are based on and compare them with specimens collected from the native range of *F. palmata* in the Old World, as well as the full range of variation in cultivated *F. carica*.

Variation in *Ficus palmata* and *F. carica*

Thirty-one specimens from three herbaria (MO, NA, and US), representing *Ficus palmata* from throughout its native range, were examined and coded for morphological characters that potentially distinguish the species from *F. carica*. The results are shown in Table 1, along with characters of cultivated *F. carica*, taken from 70 sheets of cultivated figs, and characters of the vouchers for the California reports of *F. palmata* (see below). Characters taken from herbarium specimens agree well with descriptions and illustrations of the two species from standard sources (Browicz 1982; Condit 1947; Friis 1993; Ghafoor 1985).

Representative specimens examined: *Ficus palmata*. **INDIA:** Botanical Garden, University of Delhi, Rodin 8049 (US). Setabani, *Hem Raj* s.n. 28 Feb 1931 (MO). Koraput district, Jaypore Estate, Orissa, 3000–3500 ft, *H.F. Mooney* 3893 (MO). Deopal, Garhwal, *W. Koelz* 20496 (NA). Almora, United Provinces, 6000 ft, *W. Koelz* 19996 (NA). **PAKISTAN:** Peshawar, *W. Koelz* 8206 (NA); 3 mi from Abbotabad on road to Havelion, *M. Qaiser & A. Ghafoor* 1999 (NA); Karakar, *M. Shah & Dilawar* 1001 (MO). **NEPAL:** Wada, 6600 ft, *Mr. Hoh and Rajbhandari* 1157 (US). **SAUDI ARABIA:** Al Karn, *Dwyer & El Sheikh* 13676 (MO). **YEMEN:** Attara, 1900 m, *Deflers* 402 (US). **ERITREA. Amasen:** Ad Rassi, *Pappi* 4925 (US). **ETHIOPIA. Kaffa Prov.:** 7 km E of Jimma, *Burger* 1158, *Meyer* 7820 (US). **Harar Prov.:** 22 km SE of Harar, ca. 1350 m, *Burger* 1158, 1622 (US).

Ficus carica (all cultivated, all deposited at NA). **CHILE. Juan Fernandez Islands:** Mas Afuera, *E.G. Meyer* 9461. **IRAN.** Tehran, *W. Koelz* 16085. **U.S.A. Arkansas. Drew Co.:** Monticello, *E. Sundell* 9111. **California. Alameda Co.:** Niles, *J. Jones* 23041. **Butte Co.:** Chico, *W.F. Wight* 1279. **Riverside Co.:** Citrus Experiment Station, Riverside, *I.J. Condit* 1. **Santa Barbara Co.:** Franceschi Nursery, Santa Barbara, *W.F. Wight* 4879. **Sonoma Co.:** Sonoma, *H. Grinstead* s.n. 4 Jun 1978. **Florida. Alachua Co.:** Gainesville,

F.G. Meyer & P.M. Mazzeo 14365. Georgia. Morgan Co.: Madison, *F.G. Meyer & P.M. Mazzeo 20440. Illinois. Cook Co.:* Morton Arboretum, Lisle, *N. Gavlak 4098V90. South Carolina:* Columbia, *J.B. Nelson 19580. ZIMBABWE:* Salisbury, *H. M. Bigel 4444.*

California material referred to *Ficus palmata*

The collections cited as *Ficus palmata* and *F. pseudo-carica* by Smith (1976) and Hrusa et al. (2002) are part of a series of four collections made by Henry Pollard (Pollard s n. 20 November 1955, 29 September 1956, 23 December 1958, and 28 November 1959 [all CAS]). All bear the same locality data (bed of west fork of Cold Spring Canyon, Santa Barbara Co.) and evidently came from the same colony (perhaps the same plant), described by Pollard on the herbarium labels as a clump of tall, suckering stems growing among boulders in the streambed. The plant was evidently immature when Pollard first collected it, and he revisited it several times to get more mature material. The first three specimens (1955, 1956, and 1958) are all sterile, and the 1956 label specifically describes the plants as “Adventive seedlings,” while the 1959 collection is the only fertile specimen in the series, and the label says: “Largest shoots, heretofore sterile, beginning to bear fruit.” The 1955 collection was annotated, apparently in Pollard’s handwriting, as *F. carica*; the others were named “*Ficus pseudo-carica* Miq.?” all three with the question mark.

Morphological characters of these specimens are given in Table 1.

RESULTS

The Pollard collections from Cold Spring Canyon match *F. carica*, not *F. palmata*, in most of their characters (the thickness and dark coloration of the twigs, the large, deeply lobed leaves with obtuse or acute apices, strongly cordate bases, and shallowly crenate margins, and the turbinate fruit). Only the density of the indumentum on the twigs and petioles is in any way unusual for *F. carica*, and this character is rather variable in *F. carica*. The indumentum is dense only in the earlier Cold Spring Canyon collections (1955 and 1956, made when the plants were quite immature); later collections, made as they approached and reached sexual maturity (1958 and 1959), show sparser indumentum, within the normal range of variation of *F. carica*. The plant collected by Pollard and reported by several authors as *F. pseudo-carica* or *F. palmata* is clearly *F. carica*; the unusual indumentum characters may be related to juvenility. Specimens of *F. palmata* have occasionally been grown horticulturally in the United States (W.F. Wight 4870, Franceschi nursery, Santa Barbara California, NA), but there is no evidence that the species has ever escaped from cultivation. It should be excluded from the adventive flora of North America.

***Morus nigra* in the southwest**

Black mulberry (*Morus nigra*) is a small tree native to the mountains of southwest Asia (probably Iran and the Caucasus). It is a very old cultigen—mulberry

TABLE 1. Comparison of morphological characters of Asian *Ficus palmata*, cultivated *F. carica*, and California specimens forming the basis of the North American reports of *F. palmata*. The last column notes for each morphological character which species is the best match for the California specimens.

	<i>Ficus palmata</i>	<i>Ficus carica</i>	Basis of CA <i>F. palmata</i> report	
Material coded	31 sheets from India, Nepal, Pakistan, Saudi Arabia, Yemen, Eritrea and Ethiopia	ca. 70 sheets, cultivated worldwide	4 Pollard collections, W fork Cold Spring Canyon, Santa Barbara Co., CA	Best match for Pollard figs
Twig color	tan or brown, sometimes, greenish, usually with a \pm ashy cast from the white indumentum	brown, usually dark	purplish brown	<i>F. carica</i>
Twig diameter mm	1.5–4	4–5	4–6	<i>F. carica</i>
Twig indumentum	moderately to densely hirsute	glabrous or sparsely hirsute	sparsely to moderately hirsute	intermediate
Petiole length mm	16–70	40–119	110–125	<i>F. carica</i>
Petiole indumentum	sparsely to densely hirsute, seldom puberulent	glabrous or sparsely hirsute	sparsely to moderately hirsute	<i>F. palmata</i>
Blade length mm	57–142	114–211	240–320	<i>F. carica</i>
Blade width mm	50–140	129–210	240–370	<i>F. carica</i>
Blade shape	ovate to triangular	ovate to very broadly ovate in outline	ovate to very broadly ovate in outline	either
Blade lobing	usually unlobed, seldom 3(–5)-lobed to 0.4(–0.7) of length	3–5-lobed 0.5–0.85 of length (rarely shallowly lobed)	5-lobed 0.75–0.8 of length	<i>F. carica</i>
Blade/lobe margin	shallowly to strongly crenate-toothed or bluntly toothed	crenate or irregularly wavy	crenate	<i>F. carica</i>
Blade base	broadly obtuse to truncate or shallowly cordate	shallowly to deeply cordate, rarely broadly obtuse	cordate	<i>F. carica</i>
Blade apex	rounded, apiculate or acuminate	rounded or obtuse, very rarely acute but never acuminate	obtuse or acute	<i>F. carica</i>
Fruit shape	globose, often from a linear stipe-like base	turbinate	turbinate	<i>F. carica</i>
Fruit width mm	9–15 mm	more than 15 mm	too immature to measure	—

seeds are known from early archaeological sites in Mesopotamia and Egypt (Brothwell & Brothwell 1969)—and black mulberry is now widespread in central and western Asia and the Mediterranean basin. In the North American botanical literature, the name *M. nigra* has been confused since Small (1903, 1933) misapplied it to dark-fruited forms of *M. alba*, an east Asian species that is widely naturalized in the United States (Wunderlin 1997). Wunderlin's discussion seems to suggest that the two taxa may be conspecific, but *M. alba* and *M. nigra* are actually quite distinct, differing (among other features) in their chromosome numbers, *M. alba* being diploid with $2n=28$ while a variety of polyploid or high aneuploid numbers, varying from $2n=89-308$, have been reported for *M. nigra* (Voltattorni 1947; Darlington & Wylie 1955; Hans 1972).

Morus nigra was reported to escape occasionally in Beatty Townsite, Nye Co., Nevada, by Beatley (1976). This report has not been mentioned in subsequent publications, including the Flora of North America Moraceae treatment (Wunderlin 1997). A check of Beatley's vouchers showed that they are correctly determined and also revealed specimens of apparent waifs collected by Henry M. Pollard at a site in southern California (see below for specimen data). These collections indicate that black mulberry is able to reproduce as a waif at widely separated sites in the southwestern United States. It is only known as a waif in disturbed areas close to settlements, and there is no evidence that it can persist for long periods or disperse into intact natural vegetation. The species is not correctly described or keyed in any North American flora (except McMinn & Maino 1947, who included it as a cultivated species), so a brief description of *M. nigra* and an emended key for the region are provided. In order to enlarge the sample size and capture the normal range of variation in the species, the description below was supplemented with cultivated material from the southwestern United States. Illustrations of *M. nigra* are provided by McMinn and Maino (1947, fig. 203) and Browicz (1982, fig. 1).

KEY TO SPECIES OF *MORUS* IN THE WESTERN UNITED STATES

1. Leaves reniform-triangular to almost circular, base deeply cordate. Styles 3–5 mm long, densely hairy all over. Syncarp purple-black or black _____ **M. nigra**
1. Leaves ovate or triangular-ovate, base rounded, truncate, or shallowly cordate. Styles 1–2 mm long, glabrous (rarely with a few hairs). Syncarp red, purple, or white.
 2. Upper surface of leaf smooth, often very shiny, glabrous or with a few hairs on the main veins; underside glabrous except for scattered hairs on the major veins or in vein axils. Syncarp short-cylindrical to almost spherical, $0.6-1.8 \times 0.5-0.7$ cm _____ **M. alba**
 2. Upper surface of leaf dull, often scabrous, with hairs (very inconspicuous in *M. rubra*) evenly scattered over the blade; underside pubescent with hairs evenly scattered over the veins and blade. Syncarp various.
 3. Trees to 20 m tall. Leaves ovate to subcordate or almost circular, $7-28 \times 7-25$ cm, if lobed then lateral lobes abruptly acuminate. Syncarp short-cylindrical, $1-1.9 \times 0.6-0.8$ cm _____ **M. rubra**

3. Low shrubs to small trees 2–5 m tall. Leaves ovate or triangular-ovate, 2.8–8.3 × 1.6–5.3 cm, apex abruptly acuminate, if lobed then lateral lobes acute, obtuse, or occasionally rounded. Syncarp more or less spherical, 0.5–1.2 × 0.6–1.3 cm _____ **M. microphylla**

Morus nigra L., Sp. Pl. 2:986. 1753. BLACK MULBERRY

Small trees 3–5 m tall. Twigs brown, 2–4 mm thick, puberulent, pilose, or glabrous; buds ovoid, 5–7 mm long. Petiole 1.2–3.0 cm long, pubescent with long soft hairs, at least ventrally. Blade reniform-triangular to almost circular, unlobed or rarely 3-lobed, 7–16 cm long and wide, (3–)5-veined from base; base deeply cordate, apex abruptly short-acuminate, margins dentate, teeth rounded-obtuse, 2–5 mm long; upper surface green, smooth or very weakly scabrous, glabrous or with a few scattered hairs mostly confined to the major veins; underside lighter green, soft-pubescent on veins and blade. Unisexual. Styles 3–5 mm long, densely hairy all over. Fruiting peduncle densely pubescent; syncarp short-cylindrical, 1.4–2.2 cm long, 1.0–1.6 cm wide, purple-black or black.

Specimens examined. **U.S.A. NEVADA. Nye Co.:** apparently escaped, in thicket with Screw-bean, Beatty townsite, Amargosa drainage, 3300 ft, U.S.A. E.C.'s Nevada Test Site, *J. Beatley 13438* (US). **CALIFORNIA. Ventura Co.:** two small trees in low waste ground in dense brake of *Rubus procerus*, S of railroad and Fox St. drain, Ojai, origin unknown, location suggesting escape from cultivation, *H.M. Pollard s.n.*, 21 Oct 1965 (NA); same locality, *H.M. Pollard s.n.*, 20 Jun 1968 (NA).

ACKNOWLEDGMENTS

I would like to thank the curators at CAS, MO, UC and US for providing facilities for work at their herbaria, and Guy Nesom, Steve Boyd, Dieter Wilken, and Margriet Weatherwax for helpful comments.

REFERENCES

- BEATLEY, J.C. 1976. Vascular plants of the Nevada Test Site and central-southern Nevada. Springfield, VA, National Technical Information Service, TID-26881.
- BROTHWELL, D. and P. BROTHWELL. 1969. Food in antiquity. Ed. 2. Baltimore: Johns Hopkins University Press.
- BROWICZ, K. 1982. Moraceae. Flora Iranica fascicle 153. Graz: Akademische Druck- u. Verlagsanstalt.
- CONDIT, I.J. 1947. The fig. Waltham, Mass.: Chronica Botanica Co.
- DARLINGTON, C.D. and A.P. WYLIE. 1955. Chromosome atlas of flowering plants. Ed. 2. London: Allen & Unwin Ltd.
- FRIIS, I. 1993. Moraceae. In: M. Thulin, ed. Flora of Somalia, vol. 2. London: Royal Botanic Gardens, Kew. Pp. 91–104.
- GHAFOOR, A. 1985. Moraceae. Flora of Pakistan fascicle 171. Islamabad: Pakistan Agricultural Research Council; and Karachi: Dept. of Botany, University of Karachi.
- HANS, A.S. 1972. Cytomorphology of arborescent Moraceae. *J. Arnold Arbor.* 53:216–225.
- HRUSA, F., B. ERTTER, A. SANDERS, G. LEPPIG, and E. DEAN. 2002. Catalogue of non-native vascular

- plants occurring spontaneously in California beyond those addressed in The Jepson manual—part I. *Madroño* 49:61–98.
- McCLINTOCK, E. 1993. Moraceae. In: J.C. Hickman, ed. The Jepson manual: higher plants of California. Berkeley: University of California Press. Pp. 764–765.
- McMINN, H.E. and E. MAINO. 1947. An illustrated manual of Pacific Coast trees. Ed. 2. Berkeley: University of California Press.
- MUNZ, P.A. 1974. A flora of southern California. Berkeley: University of California Press.
- SMALL, J.K. 1903. Flora of the southeastern United States. New York: Published by the author.
- SMALL, J.K. 1933. Manual of the southeastern flora. New York: Published by the author.
- SMITH, C.F. 1976. A flora of the Santa Barbara region, California. Santa Barbara: Santa Barbara Museum of Natural History.
- SMITH, C.F. 1998. A flora of the Santa Barbara region, California. Ed. 2. Santa Barbara: Santa Barbara Botanic Garden.
- VOLTATTORNI, S. 1947. Embriologia e cariologia di *Morus nigra* L. *Annali Sperim. Agrar. N.S.* 1:149–156.
- WUNDERLIN, R.P. 1997. Moraceae. In: Flora of North America Editorial Committee, Flora of North America, volume 3. New York: Oxford University Press. Pp. 388–399.